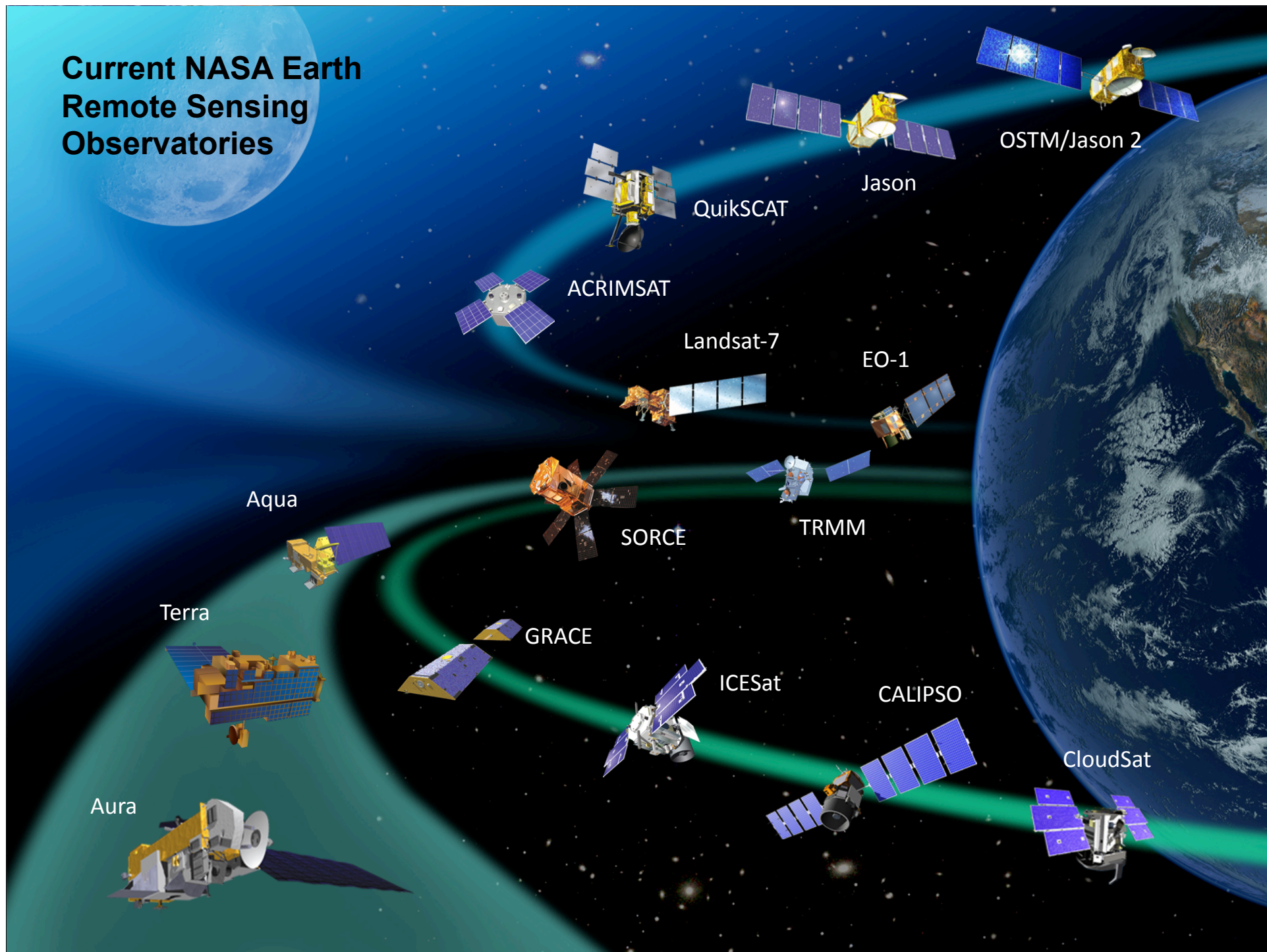


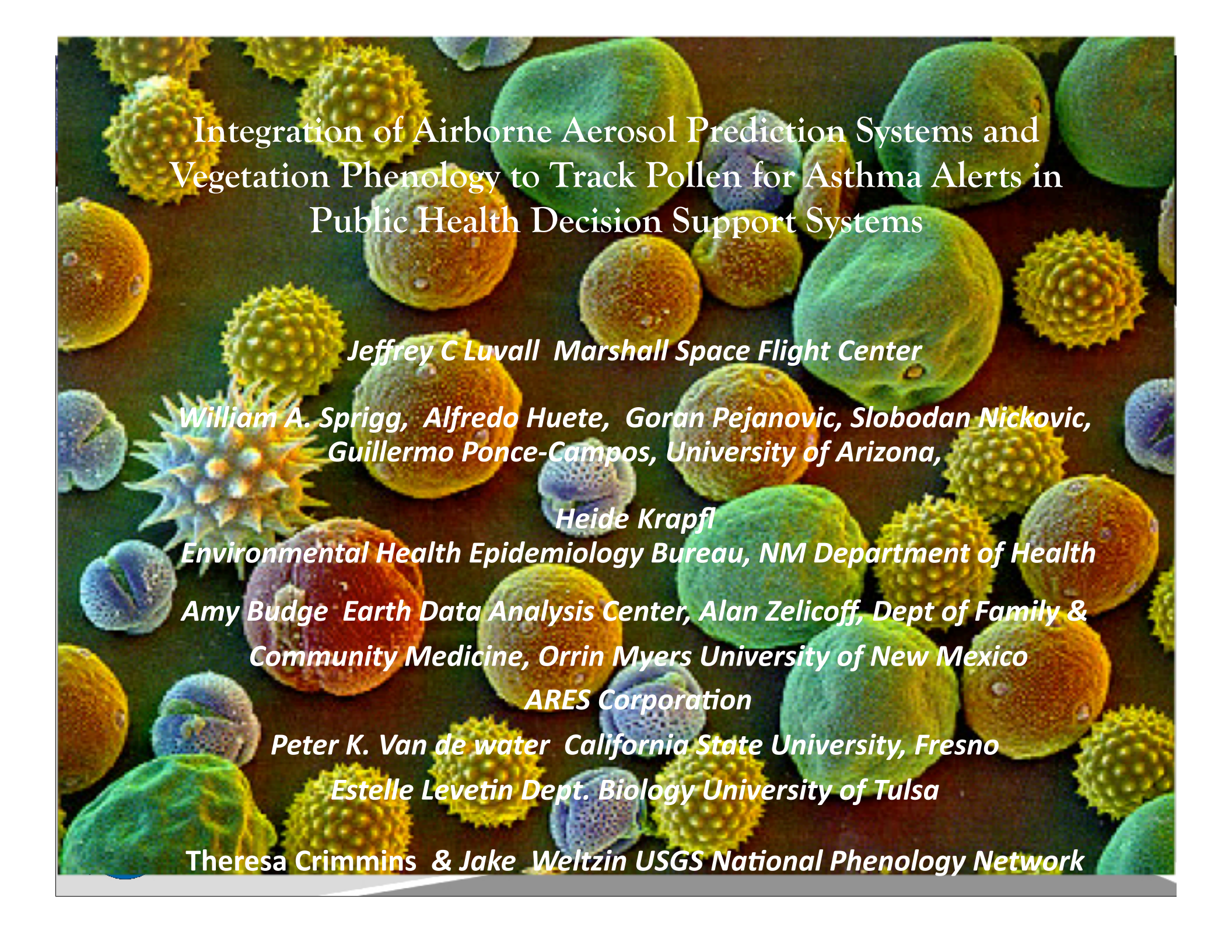
# Current NASA Earth Remote Sensing Observatories



# Focus Areas of Public Health

The Public Health application area focuses on Earth science applications to public health and safety, particularly regarding ***infectious disease, emergency preparedness and response, and environmental health*** issues. The application explores issues of toxic and pathogenic exposure, as well as natural and man-made hazards and their effects, for risk characterization/mitigation and improvements to health and safety.





# Integration of Airborne Aerosol Prediction Systems and Vegetation Phenology to Track Pollen for Asthma Alerts in Public Health Decision Support Systems

*Jeffrey C Luvall Marshall Space Flight Center*

*William A. Sprigg, Alfredo Huete, Goran Pejanovic, Slobodan Nickovic,  
Guillermo Ponce-Campos, University of Arizona,*

*Heide Krapfl*

*Environmental Health Epidemiology Bureau, NM Department of Health*

*Amy Budge Earth Data Analysis Center, Alan Zelicoff, Dept of Family &  
Community Medicine, Orrin Myers University of New Mexico*

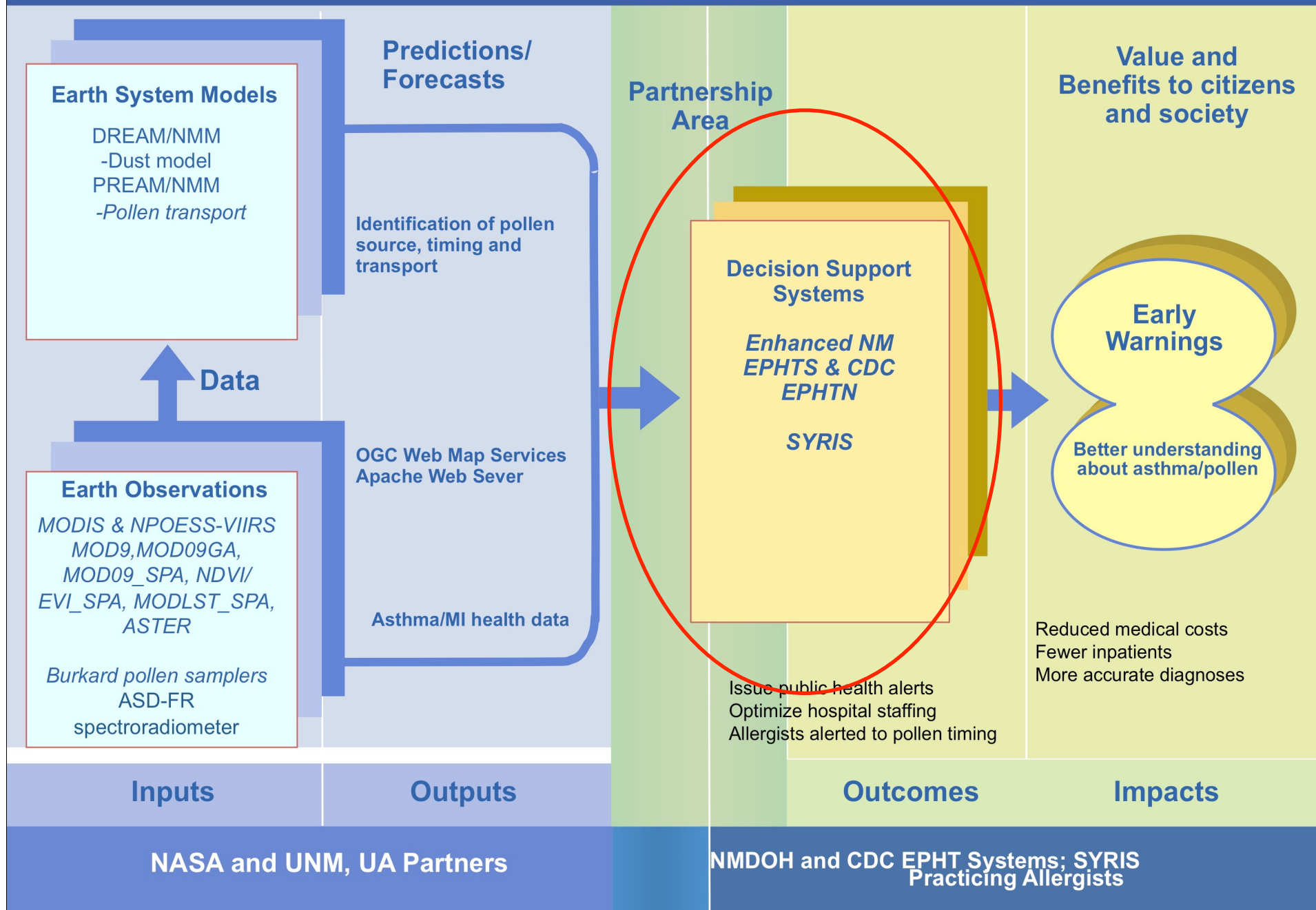
*ARES Corporation*

*Peter K. Van de water California State University, Fresno*

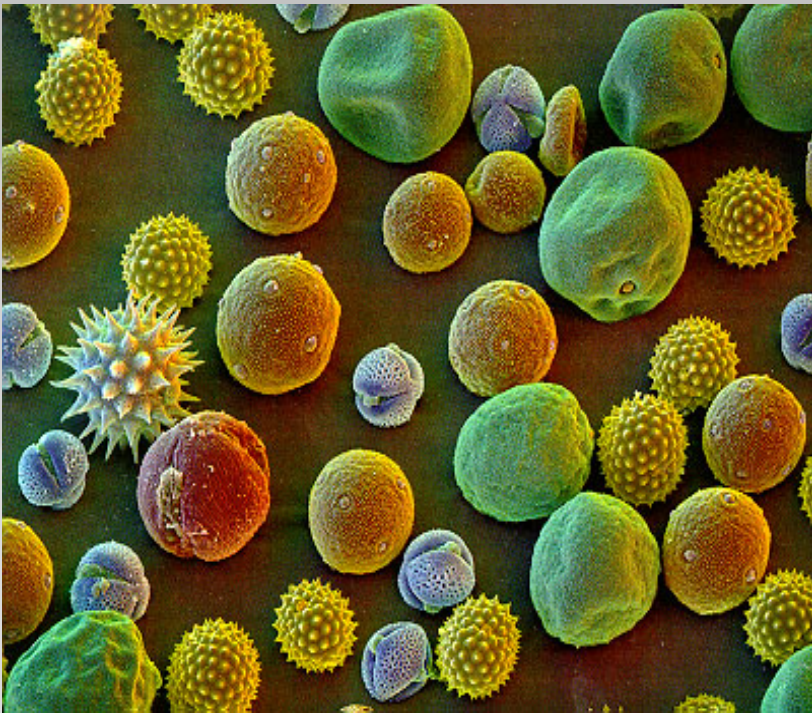
*Estelle Levetin Dept. Biology University of Tulsa*

*Theresa Crimmins & Jake Weltzin USGS National Phenology Network*

# Tracking Pollen for Asthma Alerts in Public Health DSS (Luvall)



# Top pollen-producing species



## Los Alamos

juniper  
sagebrush  
pine  
Alternaria\*  
oak  
grass  
ragweed  
goosefoot  
Cladosporium\*  
Myxomycete\*  
cottonwood  
mulberry  
aster  
elm

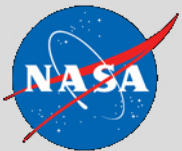
## Albuquerque

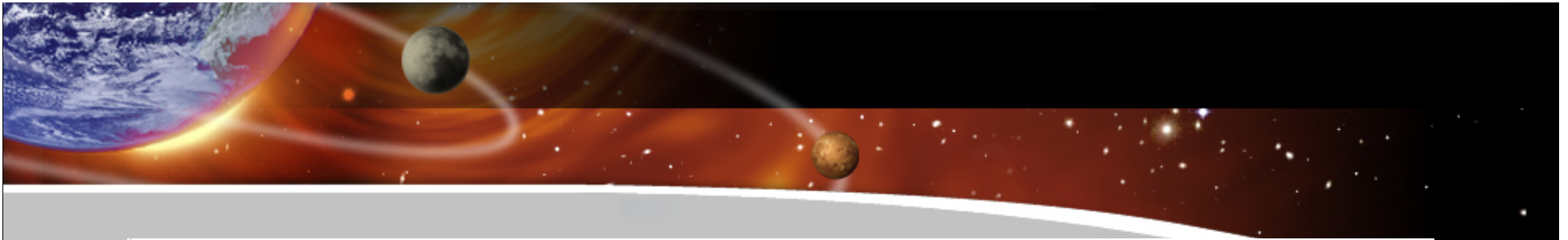
mulberry  
juniper  
ash  
goosefoot  
cottonwood  
grass  
sagebrush  
pine  
elm  
aster  
ragweed  
sycamore  
oak  
willow



\*fungal / slime mold spores

# Burkard Spore Trap





## PollenCast for Tucson, Arizona



Tree

Grass

Weed

### Reported Levels

Tree pollen count for  
today, 03/31/08:

**Moderate**

[See past pollen counts for  
Tucson, Arizona](#)

### Forecasted Levels

VERY HIGH

HIGH

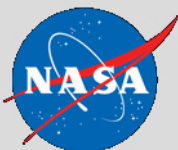
MEDIUM

LOW

NO ACTIVITY



*Forecast  
not  
available*



# Limitations of Pollen Sampling

- Lack of stations
- Count frequency & reporting lag time
- Different sampling instruments Rotorod Sampler/Burkard Spore Trap
- Only indentifiable pollen “grains”
- Expertise in counting/indentification
- Refusal to release sampling information-“*We do not reveal the sources for our data for privacy and proprietary, competitive reasons. Some pollen counts are conducted privately, and are not meant to be broadcast to the public*”



# Pollen Timing

- *Growing Degree Days* - the average of the daily maximum and minimum temperatures compared to a base temperature,  $T_{\text{base}}$ , (usually 10 °C)
- Response to length of day
- Species differences
- Climate – Variability in Precipitation
- Weather



# Airborne Dust Simulations and Forecasts

University of Arizona  
With NASA Earth System Science & University of New Mexico

Department of Atmospheric  
Sciences

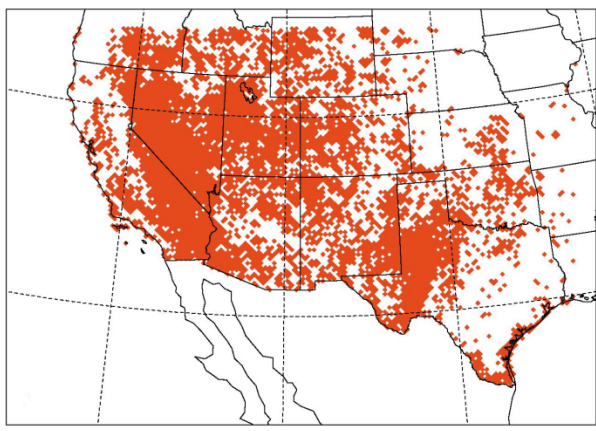
Phoenix dust storm – 7 June 2006  
Photo by Robb Schumacher Arizona Republic



<http://www.atmo.arizona.edu/faculty/research/dust/dust.html>

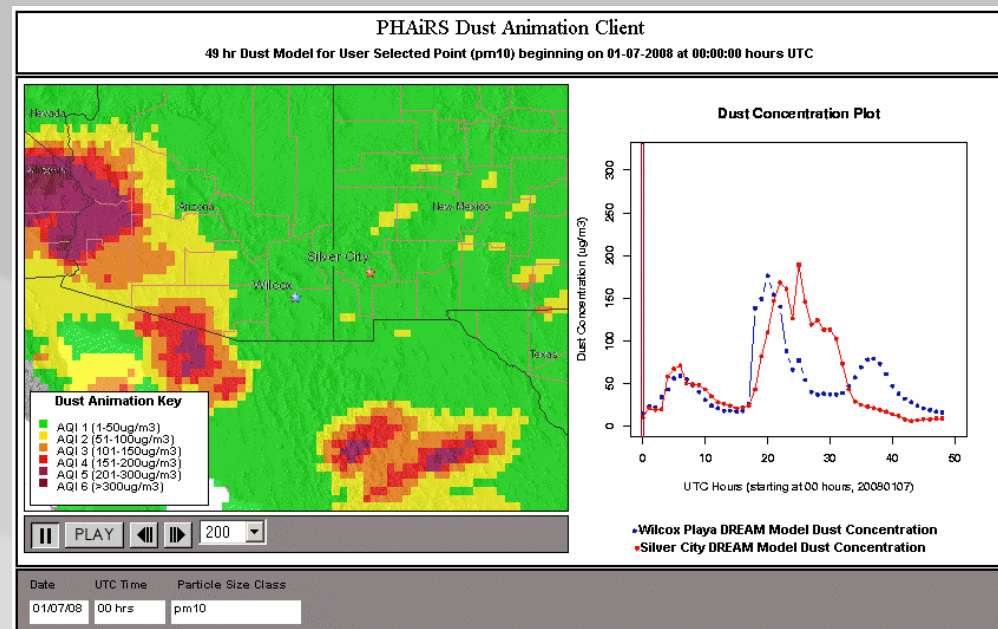
# Phenology and Pollen Transport

NASA MODIS data



Pollen sources derived from  
**phenological** maps

DREAM – UofA numerical  
meteorological particulate  
transport model

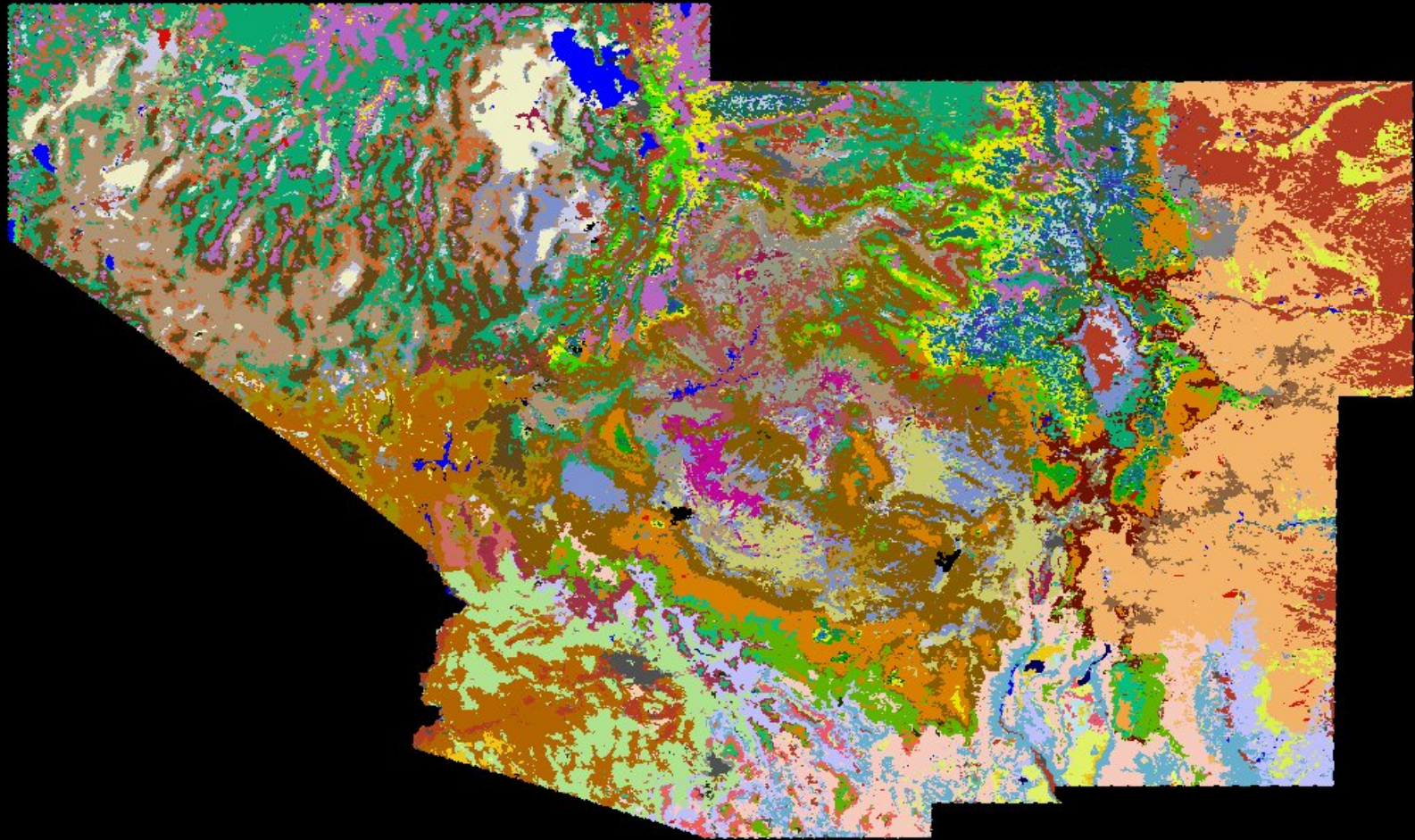


Final Product – predicted concentrations of  
pollen in time and space



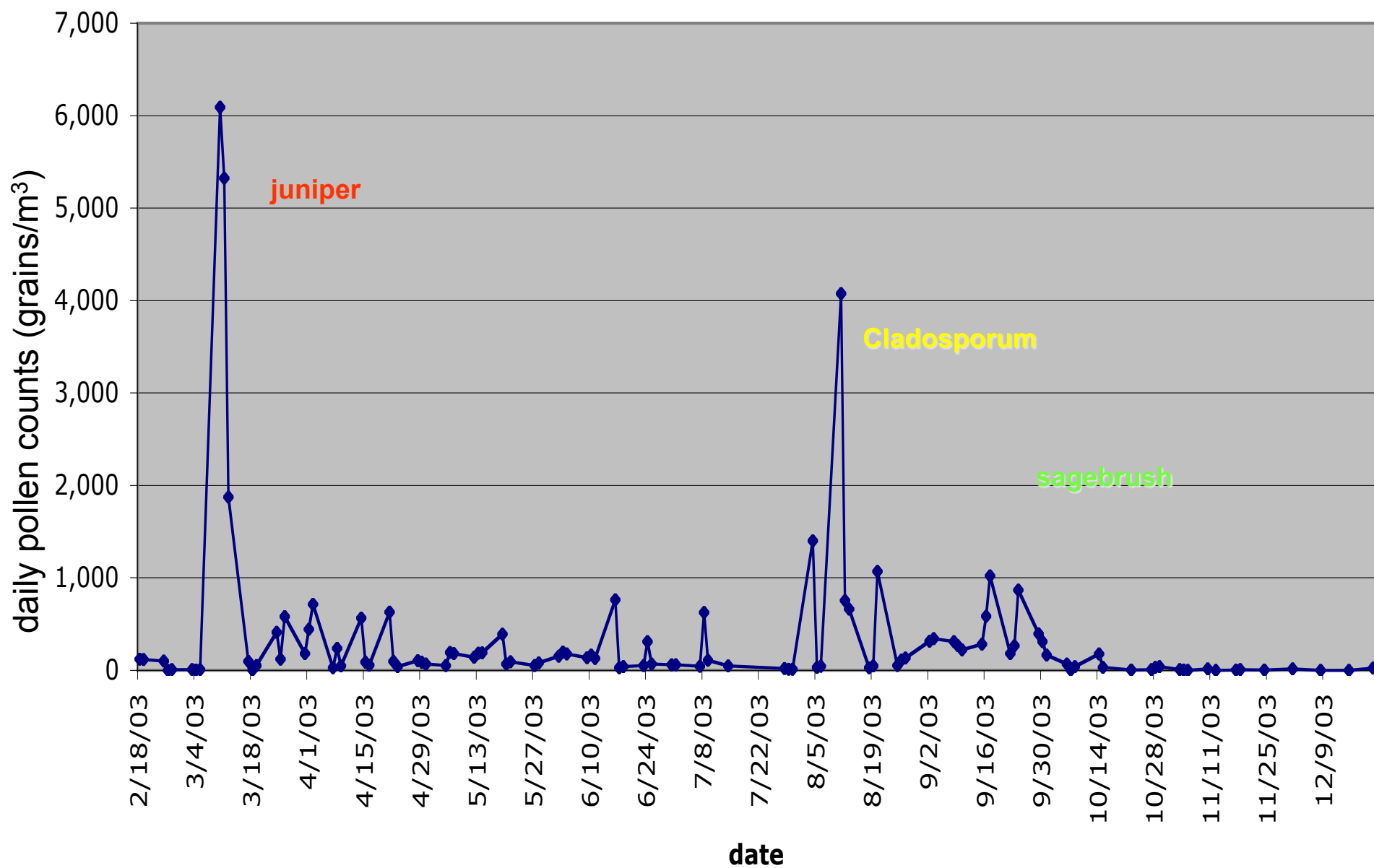
# LAND COVER SOURCE

## Southwest Regional Gap Analysis Project

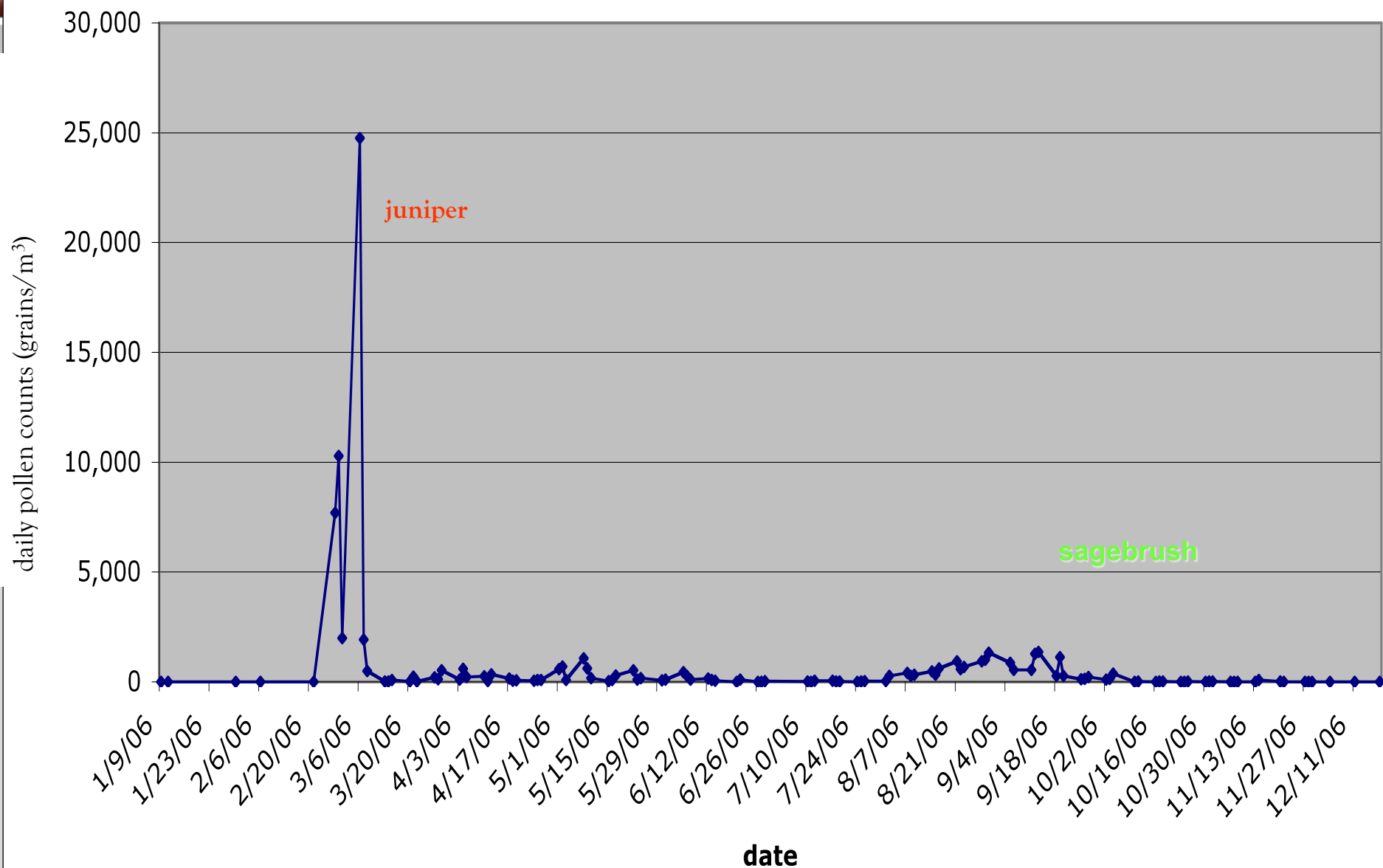


Biodiversity for AZ, CO, NV, NM, UT

## 2003 Los Alamos daily pollen counts



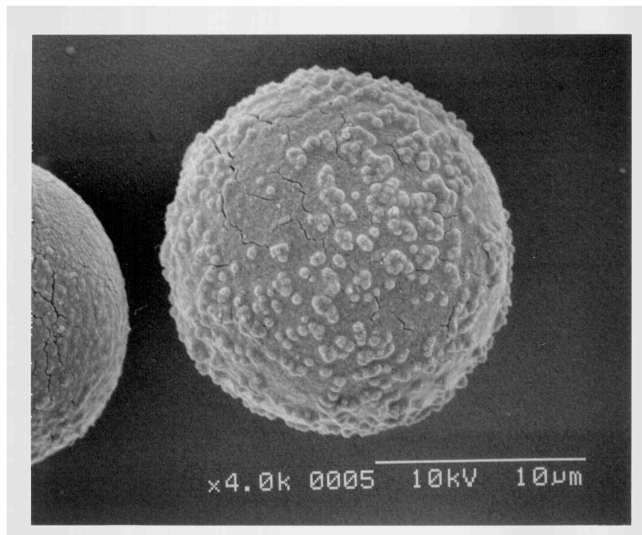
## 2006 Los Alamos daily pollen counts



# Pollen Strategy

- Select *Juniperus* spp. of Interest
- Map Pollen Source
- Estimate Emission on Test Date
- Prepare Model
  - Insert Terrain & Pollen Aerodynamic Characteristics
  - Insert Source Emission
  - Insert Meteorology
- Simulate Downwind Pollen Dispersal
- Evaluate

# Juniper Pollen

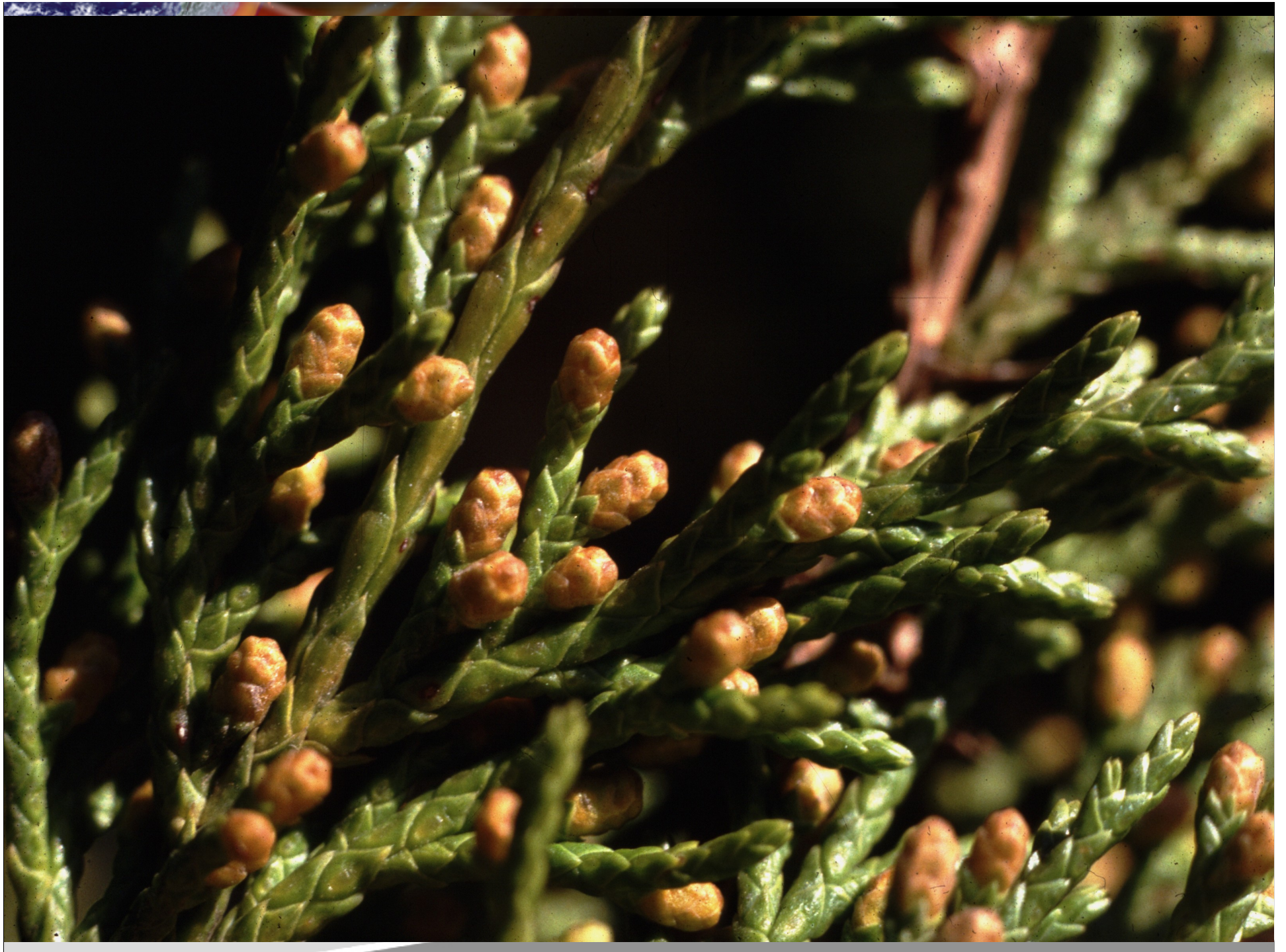


*Juniperus virginiana*

## Good News for Modeling

- Pollination Dec-March, little confusion with other pollinating plants
- *Juniperus* pollens are (mostly) spherical, 20µm size













04/13/2009 14:11



04/13/2009 15:05

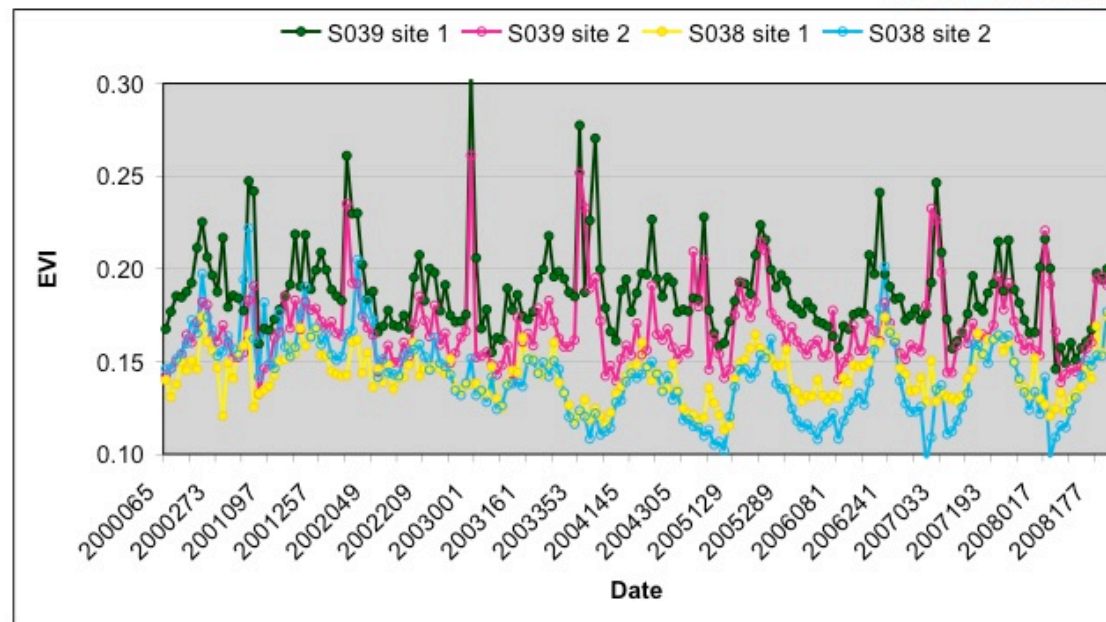


# Spectral characteristics of male juniper canopies at different bud density levels



Density level	Bud density (g/m <sup>2</sup> )
1	204.2
2	190.0
3	176.9
4	164.9
5	151.1
6	136.2
7	115.8
8	92.9
9	45.9
10	0.0

# MODIS Juniper Time Series



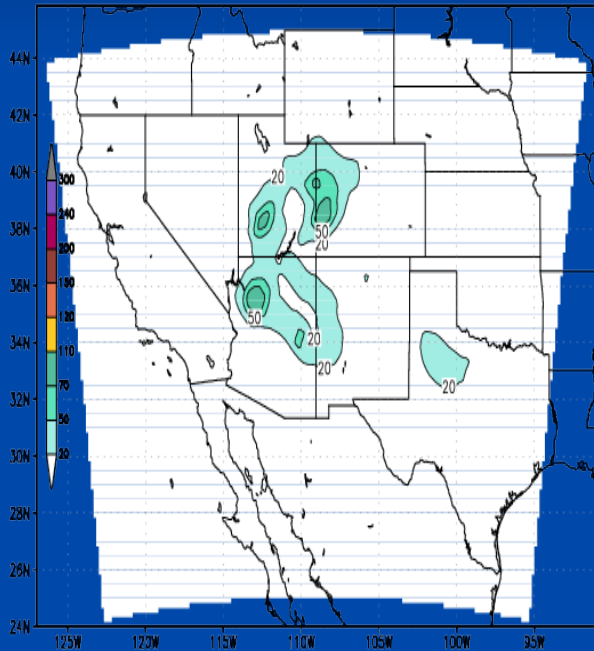
70-90% density

Enhanced Vegetation

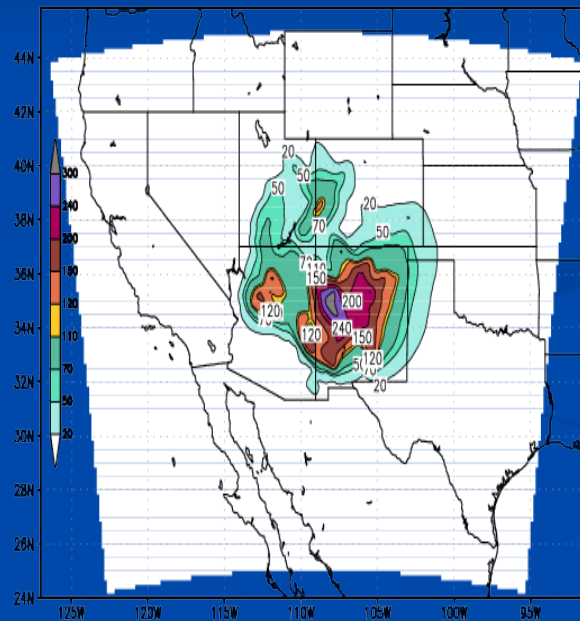
# Juniper Pollen

## Near-surface concentration (Nm<sup>3</sup>)

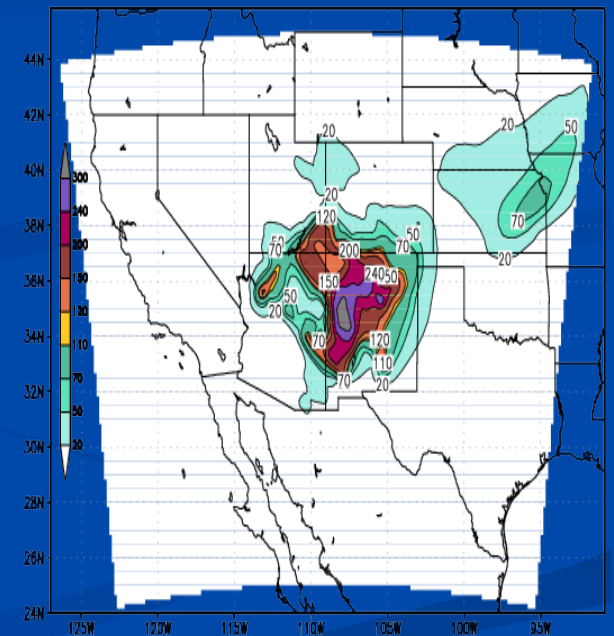
PREAM



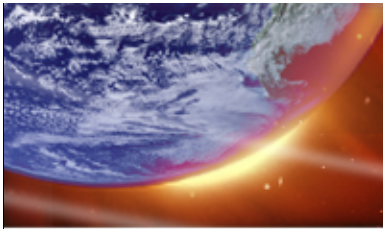
6 March 2006



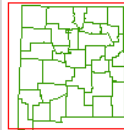
9 March 2006



11 March 2006



## Welcome to the New Mexico EPHT Mapping Applications Page

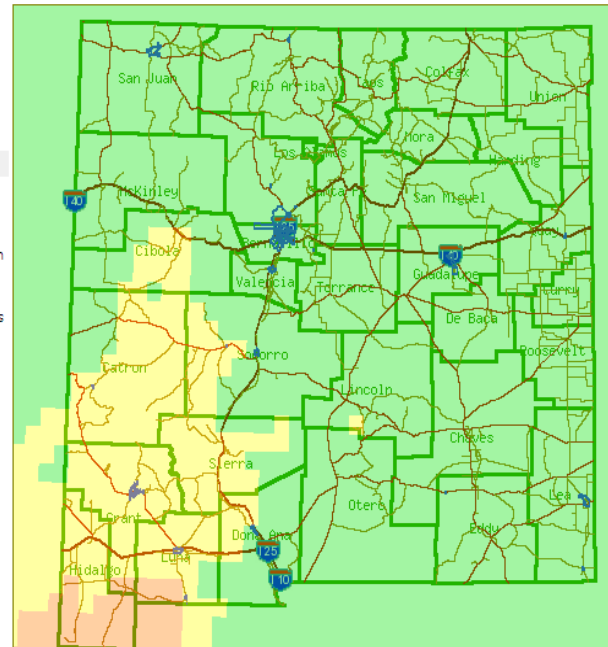


### How to use this map

The layers that you have requested to map are listed below. To add them to the map click 'add to map'. When you first add your EPHT query layer it will appear above the other layers in your map. You can use the arrowed buttons beside each layer in the table of contents to move layers up and down in the list for viewing. Navigation controls for the map are just below the map. Hovering over any of the controls gives you directions for their use. You must have popups enabled in your web browser in order to be able to query features in the map. You can use the small locator map above to zoom on the map in addition to using the zoom button below the map, just click and drag.

### Map Layers from: your EPHT data search

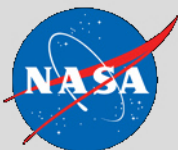
DREAM dust output PM2.5 -  
Classified 24-Hr Mean 2009-04-  
11T00:00:00Z [add to map](#)



lon:      lat:

### Table of Contents

1	<input checked="" type="checkbox"/>		DREAM dust output PM2.5 - Classified 24-Hr Mean 2009-04-11T00:00:00Z
	<input type="checkbox"/>		Excellent
	<input type="checkbox"/>		Good
	<input type="checkbox"/>		Moderate
	<input type="checkbox"/>		Unhealthy for Sensitive Groups
	<input type="checkbox"/>		Unhealthy
	<input type="checkbox"/>		Very Unhealthy
	<input type="checkbox"/>		Hazardous
2	<input checked="" type="checkbox"/>		Water System Boundaries
	<input type="checkbox"/>		Water System Boundaries



# ephtracking.cdc.gov

National Environmental Public Health Tracking Network - Windows Internet Explorer

http://ephtracking.cdc.gov/showHome.action

File Edit View Favorites Tools Help

Convert Select

National Environmental Public Health Tracking N...

Page Tools

CDC Home



Centers for Disease Control and Prevention  
Your Online Source for Credible Health Information

## National Environmental Public Health Tracking Network

Home About Tracking Program State & Local Tracking Portals Indicators & Data Secure Portal

Tracking A-Z Index A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #

GLOSSARY

CDC A-Z

TRACKING A-Z



Environmental causes of chronic diseases are hard to identify. Measuring amounts of hazardous substances in our environment in a standard way, tracing the spread of these over time and area, seeing how they show up in human tissues, and understanding how they may cause illness is critical. The National Environmental Public Health Tracking Network is the start of that system.

The National Environmental Public Health Tracking Network is a system of integrated health, exposure, and hazard information and data from a variety of national, state, and city sources. On the Tracking Network, you can explore information and view maps, tables, and charts about health and environment across the country. [Learn more about tracking.](#)

### Page Options

Text Size: - +

- Printer-friendly version
- Get Email Updates
- Bookmark and Share

### Tracking Hot Topics

- Healthy Homes
- National Environmental Public Health Conference: Oct 26-28, Atlanta

### Resources

- Communication Features
- Document Library
- Quick Reports
- Technical Notes

### Contact Us

### Environments



### Health Effects



### Info by Location



Internet | Protected Mode: On

100%

6 Microsoft Office...

5 Windows Explor...

SAS

Novell GroupWise -...

National Environm...

8:57 AM

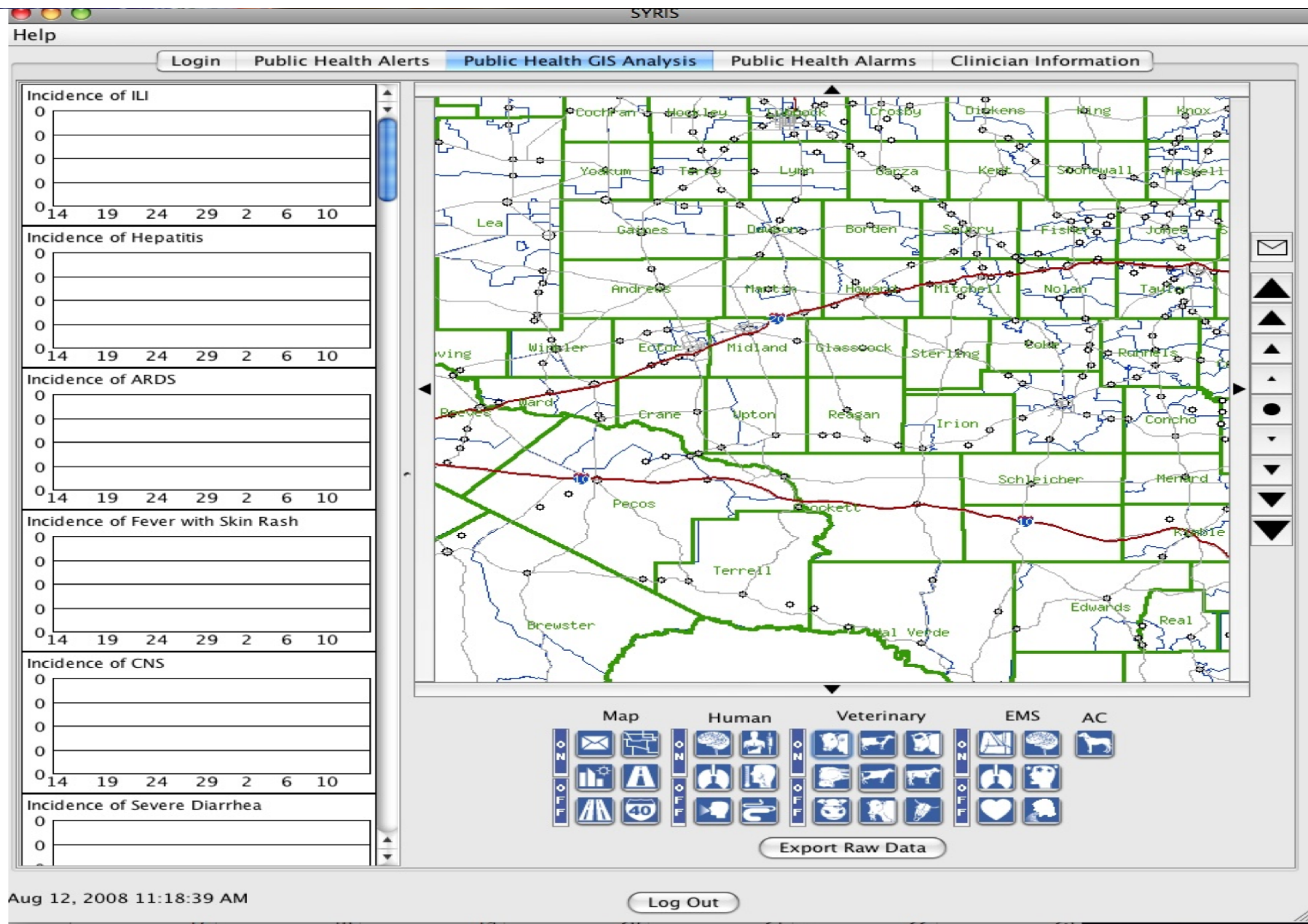
# Syndrome Reporting Information System™



## *The SYRIS system provides:*

- Real-time, Syndrome-Based Reporting Tool
- 2-Way Real-time Communication System - 24/7
- Automated, Immediate 'Alerts' to Public Health Officials (PHO's)
- Health 'Alerts' to Vets, Doctors, Hospitals, & Schools
- Web-Based Tool for Easy Syndrome Entry and Communication
- Geographic Mapping of Disease Outbreaks
- Connects All Health Care Providers to a Common Database
- Instantaneous Geographic Mapping of Disease Outbreaks
- Full compliance with the requirements of Public Law 109-417 (the Pandemic and All-Hazards Preparedness Act)





SYRIS will be used by Public Health Officials for interactive display of PREAM pollen maps, syndrome reporting and alerts

## Conclusions

- ✓ The residual signal indicates that the pollen event may influence the seasonal signal to an extent that would allow detection, given accurate QA filtering and BRDF corrections. MODIS daily reflectances increased during the pollen season.
- ✓ The DREAM model (PREAM) was successfully modified for use with pollen and may provide 24-36 hour running pollen forecasts.
- ✓ Publicly available pollen forecasts are linked to general weather patterns and roughly-known species' phenologies. These are too coarse for timely health interventions. PREAM addresses this key data gap so that targeting intervention measures can be determined temporally and geospatially.
- ✓ The New Mexico Department of Health (NMDOH) as part of its Environmental Public Health Tracking Network (EPHTN) would use PREAM a tool for alerting the public in advance of pollen bursts to intervene and reduce the health impact on asthma populations at risk.
- ✓ SYRIS provides direct feedback *from* and *to* the health community.

